VOL'PER, I.N. (Leningrad)

Scientific principles for recipes for some products in the food industry. Vop.pit 21 no.4:88-90 Jl-Ag '62. (MIRA 15:12)
(FOOD INDUSTRY)

28(1) SOV/118-59-4-5/25

AUTHOR: Vol'per, I.N., Engineer

TITLE: Mechanization and Automation in the Packaging of Food Concentrates

PERIODICAL: Mekhanizatsiya i avtomatizatsiya proizvodstva, 1959, Nr 4, pp 17-21 (USSR)

ABSTRACT: At the Leningradskiy kombinat pishchevykh kontsentratov (Leningrad Food Concentrate Combine), 95% of the total production is turned out in parcels. At present, the Leningrad Combine uses 22 wrapping and packing machines of various brand, type and design. The Soviet made APB machine, produced by the Voronezhskiy mashinostroitel'nyy zavod imeni V.I. Lenina (Voronezh Machine-Building Plant imeni V.I. Lenin), is used for packing loose and powdery products (coffee, special flour for children and diet, dried breadcrumbs, etc.). The "APD" is used for packing flaky products (corn, wheat and "Gerkules" oat flakes). By using the APB machine, labor productivity has been

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APPROVED FOR RELEASE: 08/09/2001 CIA-RDP86-00513R001860720012-4"

SOV/118-59-4-5/25

Mechanization and Automation in the Packaging of Food Concentrates

raised 14 times; using the APD, labor productivity has been increased 5.5 times. Both machines are obsolete and need modernization. There is a marked difference between the a/m and, e.g., the "Khanzella" machine for packing granular and powdery products in transparent cellophane wrappings (productivity - 60 parcels per minute). UZA and UEA machines are used for packing and wrapping food concentrates (soups, porridge, jellies, etc.). Both machines are produced by the Leningradskiy mashinostroitel'nyy zavod "Krasnaya vagranka" (the Leningrad Machine Building Plant "Krasnaya Vagranka"). Quality and productivity is poor compared with the "Nagema" and "Shokopak" machines (both produced in the Soviet Zone of Germany). The author expresses his astonishment that new series of the outmoded UZA and UEA machines have been ordered again and objects to the blind copying of obsolete

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SOV/118-59-4-5/25

Mechanization and Automation in the Packaging of Food Concentrates

foreign machines. Instead, he recommends the technically advanced "Khanzella" and "Bekker-Perkins" models. There are 3 photographs, 5 diagrams, and 2 tables.

Card 3/3

VOL'PER, I.M.

First book on the technology of preservation was published 150 years ago. Kons.i ov.prom. 15 no.7:39-40 Jl '60. (MIRA 13:6)

(Food--Preservation)

VOL'PER, I.N.

VOL'PER, I.N.

Development of the production of food concentrates in the Soviet Union. Kons. i ov. prom. 12 no.10:45-47 O '57. (MIRA 11:1)

1. Leningradskiy kombinat pishchevykh kontsentratov.
(Food, Concentrated)

Vol'Per, I. N

VOL'PER, I.N.

Technology of drying and roasting chicory. Kons. i ov. prom. 13 no.1:8-10 Ja '58. (MIRA 11:2)

1. Leningradskiy kombinat pishchevykh kontsentratov.
(Chicory)

VOL'PER, I.N.

VOL'PER, I.N.

Conference on sublimation drying. Kons. i ov. prom. 13 no.1:46 Ja '58. (MIRA 11:2)

(Food--Drying--Congresses)

VOL'PER, I.M.

From the history of vegetable drying in Russia. Kons.i ov.prom. 12 no.6:22-24 Je '57. (MIRA 10:7)

1. Leningradskiy kombinat pishchevykh kontsentratov.
(Vegetables--Evaporation)

VOL'PER, I.M.

The distillation apparatus of V. N. Karazin. I. M. Vol'per. *Spirtovaya Prom.* 20, No. 2, 3-4(1961). ~~Historical~~ app. for the alc. distn., which was used experimentally in 1815, is described. Werner Jacobson

VOL'PE, I.M.; BARABANSHCHIKOVA, L.M.

Immunogenic properties of the tetanus component of polyvaccine. Zhur.mikrobiol.epid. i immun. 28 no.7:150 Jl '57. (MIRA 10:10)

1. Iz Moskovskogo universiteta imeni Lomonosova.
(TETANUS--PREVENTIVE INOCULATION)

VOL'FER, I.M.

Electricity in the food industry. Nauka i zhizn' 21 no.11:20-22 N '54. (MIRA 7:12)

1. Glavnyy inzhener Leningradskogo kombinata pishchevykh kontsentratov.
(Food industry) (Electric machinery)

VOL'PER, I.M.

V.N.Karazin's still. Spirt.prom. 20 no.2:3-4 '54. (MLRA 7:6)
(Liquor industry--History) (Karazin, Vasilii Nazarovich,)

VOL'PEM, I.M. (Leningrad)

[redacted]

M.V.Lomonosov's theories on nutrition. Vop.pit. 13 no.1:35-37 Ja-F '54. (MLRA 7:1)

(Nutrition) (Lomonosov, Mikhail Vasil'evich, 1711-1765)

Vol'per, I. N.

Vitamins in nutrition of children: feeding flour with vitamins A and D. S. N. Komarov and I. N. Vol'per (All-Union Sci. Research Vitamin Inst. and Food Concentrate Combine, Leningrad). *Voprosy Pitaniya* 13, No. 6, 32–4 (1954).—A good quality wheat flour contains only traces of vitamins A and D. For feeding children, 25–50 I.U. vitamin D and 30–35 I.U. vitamin A/g. can be mixed with the flour. The vitamins in the flour remained unchanged during 8.5 months storage under normal conditions. E. W.

VOL'PER, Izrail' Naumovich; BURMAN, M.Ye., retsenzent; KRUGLOVA, G.I., red.; SOKOLOVA, I.A., tekhn. red.

[Corn products and their nutritional value] Produkty iz kukuruzy i ikh pishchevaia tsennost'. Moskva, Pishchepromizdat, 1963. 88 p. (MIRA 16:5)

(Corn products)

CHECHULIN, Anatoliy Arkad'yevich; VOL'PE, L., red.

[Physics of the atom, the atomic nucleus, and elementary particles] Fizika atoma, atomnogo iadra i elementarnykh chastits; uchebnoe posobie po obshchemu kursu fiziki. Leningrad, Severo-Zapadnyi zaochnyi politekhn. in-t, 1960. 152 p. (MIRA 14:7)
(Nuclear physics) (Particles, Elementary)

MAYDEL'MAN, El' Davydovich; VOL'PE, L., red.

[Analytic mechanics; the principle of possible displacements]
Teoreticheskaia mekhanika; printsip vozmozhnykh peremeshchenii.
Pis'mennye lektsii. Leningrad, Severo-Zapadnyi zaochnyi politekhn.
in-t, 1959. 45 p. (MIRA 13:11)
(Mechanics, Analytic)

LUKIN, A.V., kand.tekhn.nauk, dotsent; VOL'PE, L., red.

[Technology of machinery manufacture; automobile and tractor manufacture; manufacture, assembly, and installations of turbires; manufacture of electrical machinery and apparatus. Technology of machinery manufacture and repair of equipment in the chemical industries; instructions and problems] Tekhnologiia mashinostroeniia, avtotraktorostroeniia, proizvodstva, sborki i montazha turbin, proizvodstva elektricheskikh mashin i apparatov. Tekhnologiia mashinostroeniia i remont oborudovaniia v khimicheskoi promyshlennosti; metodicheskie ukazaniia i kontrol'nye zadaniia. Fakul'tety: mekhaniko-tekhnologicheskii, mashinostroitel'nyi, elektroenergeticheskii i teploenergeticheskii. Leningrad, 1958. 38 p. (MIRA 12:1)

1. Severo-zapadnyy zaochnyy politekhnicheskiy institut. Kafedra tekhnologii mashinostroyeniya.
(Industrial equipment) (Machinery)

TIMOFEYEV, Vladimir Andreyevich, prof., doktor tekhn.nauk; MORDOVIN, B.M., prof., retsenzent; RYABININ, I.A., dots., kand. tekhn. nauk, inzh.-kapitan III ranga, retsenzent; GAKKEL', Ye.Ya., doktor tekhn. nauk, prof., retsenzent; ARANOVICH, B.I., dots., kand. tekhn. nauk, retsenzent; GORBENKO, B.M., st. prepodavatel', retsenzent; GEKTOR, D.S., retsenzent; VOL'PE, L., red.

[Fundamentals of the theory of automatic control] Osnovy teorii avtomaticheskogo regulirovaniia; uchebnoe posobie. Leningrad, Severo-Zapadnyi zaochnyi politekhnicheskii in-t. No.2. 1962. 195 p. (MIRA 17:1)

1.Voyenno-morskaya akademiya korablestroyeniya i vooruzheniya imeni A.N.Krylova (for Mordovin,Ryabinin).

VOL'PE, L.

TIMOFEYEV, V.A., prof., doktor tekhn.nauk; GEKTOR, D.S., starshiy prepodavatel'; MILLER, Ye.V., dotsent, kand.tekhn.nauk, otv.red.; VOL'PE, L., red.

[Instructions, course outlines and problems for the courses: Theory of automatic control and regulating devices for the field of "electrification of industrial plants"; Theory of automatic control and dynamoelectric control for the field of "electric machinery and apparatus"; Automatic control of boiler installations for the field of "boiler construction"; Automatic control and regulation of turbine installations for the field of "turbine construction"] Metodicheskie ukazaniia, programmy i kontrol'nye zadaniia po kursam: Teoriia avtomaticheskogo regulirovaniia i reguliatory dlia spetsial'nosti "elektrifikatsiia promprepriiatii"; Teoriia regulirovaniia i elektromashinnaia avtomatika dlia spetsial'nosti "elektricheskie mashiny i apparaty"; Avtomaticheskoe regulirovanie kotel'nykh ustanovok dlia spetsial'nosti "kotlostroenie"; Avtomatizatsiia i regulirovanie turbinnykh ustanovok dlia spetsial'nosti "turbinostroenie." Leningrad, 1958. 50 p. (MIRA 12:1)

1. Severo-zapadnyy zaochnyy politekhnicheskiy institut. Kafedra elektrifikatsii prompredpriyatiy.
(Automatic control)

KOROLI, O.E., dotsent, kand.tekhn.nauk; VOL'PE, L., red.

[Rectilinear vibrational movement of a point-mass; correspondence lectures] Priamolineinoe kolebatel'noe dvizhenie material'noi tochki; pis'mennye lektsii. Leningrad, Severo-zapadnyi zaochnyi politekhn.in-t, 1958. 61 p. (MIRA 12:1)
(Vibration)

PROCESSES AND PROPERTIES INDEX

CA 17

Salipyrine. M. O. Volpe and L. A. Levina. Russ. 23,402, Oct. 31, 1931. Salipyrine is prepd. by fusing salicylic acid with antipyrine. The salicylic acid and the antipyrine are moistened by any liquid before fusing.

ASA-SLA METALLURGICAL LITERATURE CLASSIFICATION

APPROVED FOR RELEASE: 08/09/2001 CIA-RDP86-00513R001860720012-4"

KOSHTOYANTS, Kh.S. [deceased]; VOL'PE, P'yetro

New experimental data on the nature of the rhythmic activity of the foot of the edible snail Helix pomatia. Zool. zhur. 41 no.9:1419-1420 S '62. (MIRA 15:11)

1. Department of Animal Physiology, State University of Moscow.
(Snails) (Muscle)

VOL'PER, N., inzh.

The magician from the Far East. IUn.tekh. 7 no.11:33-36 N '62.
(MIRA 15:12)

(Soybean)

DZYUN', V.K., inzh.; LOGAKIN, S.I., inzh.; VOL'PER, Ye.A.

They write to us. Transp. stroi. 12 no.3:61-62 Mr '62. (MIRA 16:11)

1. Glavnyy energetik Rizhskogo remontno-mekhanicheskogo zavoda (for Vol'per).

VOL'PER, Ye.A.

Portable meter board. Transp.stroi. 10 no.6:54-55 Je '60. (MIRA 13:7)

1. Glavnyy energetik Rizhskogo remontno-mekhanicheskogo zavoda. (Electric meters)

KURZON, A.G.; STAROSTENKO, A.Kh.; NEZHLUKTO, V.Ya.; PASENKO, I.A.; BYKOV, Yu.V.; VOL'PER, Ye.I.; GITEL'MAN, A.I.; GOL'DBERG, F.I.; IL'IN, K.M.; SAVITSKIY, T.A.

Principal results of testing the Soviet gas turbine plant (GTU-20) for seagoing vessels. **Sudostroenie** no.7:22-36 Jl '65.

(MIRA 18:8)

ZIL'BERSHTEYN, L.I., kand. tekhn. nauk; BONGART, A.G., kand. ekonom. nauk; SHKABATUR, K.I., inzh.; MIZERA, V.I., inzh.; VOL'PER, Yu.D., inzh.

Metal consumption coeffficients in the production of small and medium diameter, electrically welded pipe. Proizv. trub no.10:62-66 '63. (MIRA 17:10)

36798

S/137/62/000/004/073/201
A052/A101

1.2300

AUTHORS: Vol'per, Yu. D., Shkabatur, K. I.

TITLE: Manufacture of electrowelded shaped pipes at Plant im. Lenin

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 4, 1962, 38, abstract 4D221 (V sb. "Proiz-vo trub". Khar'kov, Metallurgizdat, no. 4, 1961, 72-78)

TEXT: The experiments on the manufacture of electrowelded shaped pipes at the Plant im. Lenin provided for their profiling directly on the electric pipe welding unit whose sizing mill consists of 3 horizontal driven stands, 3 vertical non-driven stands and a dressing head. At the normal operation of the unit the pipes, on leaving the sizing mill, have a certain curvature; however, the profiling and dressing of pipes proved impossible in the dressing head rolls at the same time. The experiments on profiling pipes with a simultaneous dressing by the usual method (by changing the relative position of cassettes of the dressing head) resulted in angles of different curvature in pipes, that is, in a distortion of their profile. Also the conveyance of pipes beyond the sizing mill limits was difficult, since the dressing head rolls are non-driven ones. For this reason the strip reels were butted by means of autogenous welding which led to

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S/137/62/000/004/073/201
A052/A101

Manufacture of electrowelded ...

an increased metal consumption (cutting out non-fusions and butts) and to a lower efficiency of the mill owing to stops. The use of the third stand of the sizing mill made possible to cut considerably the load on the dressing head rolls. The dressing of pipes caused no special difficulties. However, also this technological version did not eliminate the difficulties with the conveyance of pipes beyond the sizing mill limits. The most effective method of producing electrowelded shaped pipes is their production directly on the electric pipe welding unit by means of four-high stands of the sizing mill and also the application of a reliable and speedy method of cutting pipes running. The following sizes of electrowelded shaped pipes are introduced: 80 x 60 x 4.0, 60 x 60 x 4.0 and 60 x 40 x 4.0 mm.

K. Ursova

[Abstracter's note: Complete translation]

Card 2/2

SAVKIN, P.V., inzh.; KOLPOVSKIY, N.M., inzh.; VOL'PER, Yu.D., inzh.; NIKOLENKO, A.V., inzh.

Use of converter metal for the manufacture of electrically welded pipe. Met. i gornorud. prom. no.5:28-30 S-O '63. (MIRA 16:11)

1. Dnepropetrovskiy truboprokatnyy zavod imeni Lenina.

ACC NR: AT7001523 SOURCE CODE: UR/3117/65/000/006/0123/0127

AUTHORS: Katsnel'son, M. Ye. (Candidate of technical sciences); Vol'per, Yu. D. (Engineer).

ORG: none

TITLE: Radio frequency welding of medium diameter pipes

SOURCE: Leningrad. Nauchno-issledovatel'skiy institut tokov vysokoy chastoty. Trudy, no. 6, 1965. Promyshlennoye primeneniye tokov vysokoy chastoty (Industrial application of high-frequency current), 123-127

TOPIC TAGS: welding ~~machine~~ equipment, generator, steel welding, radio frequency welding, ~~steel property~~ steel pipe, steel / 51-152 welding ~~machine~~ equipment, LZ-207 power generator, 20 steel, 1Kh18N9T steel, 2 steel

ABSTRACT: Electric pipe welding machine 51-152 at the Dnepropetrovsk Pipe Factory im. V. I. Lenin (Dnepropetrovskiy truboprokatnyy zavod) was modified, and tests of radio frequency welding of medium diameter pipes were performed. The machine was equipped with a tube-type generator LZ-207 which generated 200 kw at 74 kc. Pipes 89 x 2.5 mm and 89 x 3.5 mm (made of steels 20 and 2) and 76 x 2.5-mm pipes of steels 20 and 1Kh18N9T were welded. Although the quality of the welds was superior, the yield was poor and numerous problems with the equipment were encountered. In October 1962 similar tests were performed on 140 x 4.5-mm pipes of steel 2, using 350 kc (there was insufficient time to raise the frequency to the planned 440 kc). The maximum rate reached 27.5 m/min (intermittent), and again repeated equipment failures were encountered. To make this

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ACC NR: AT7001523

progressive method of pipe welding practical, it is suggested that a reliable 600-kw, 440-kc generator be developed which will allow production rates of up to 60 m/min (continuous). It is also suggested that an analysis be made of the time and cost involved in modifying the 51-152 for radio frequency welding and that the development of new equipment for speeds of 60-120 m/min be considered.

SUB CODE: 13/ SUBM DATE: none

Card 2/2

S/137/62/000/002/061/144
A006/A101

AUTHORS: Vol'per, Yu. D., Shkabatur, K. I.

TITLE: On prolonged service life of electric pipe-welding machine rolls

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 2, 1962, 29, abstract 2D153 (V sb. "Proiz-vo trub", no. 5, Khar'kov, Metallurgizdat, 1961, 118 - 125)

TEXT: At the Plant imeni Lenin experiments were carried out to determine maximum permissible wear of the rolls of an electric pipe-welding machine in the production of basic assortment pipes. A method is suggested for calculating the dimensions of rolls of the shaping and grooving stands in regrinding; the method makes it possible, by measuring the maximum wear of rolls, to determine the magnitudes of optimum approach of semi-rolls and of the roll diameter after regrinding. Calculation of the magnitude of the semi-rolls approach by the formula derived yields an optimum magnitude of this value which is required to assure minimum reduction of the diameter of rolls to be recovered. Reconditioning of the shaping and grooving stand rolls, which is based on the calculation of their dimensions

Card 1/2

S/137/62/000/002/061/144
A006/A101

On prolonged service life of...

during regrinding, reduces the cost price of welded pipes on account of a lesser roll consumption per 1 ton of finished production.

K. Ursova

[Abstracter's note: Complete translation]

Card 2/2

L 08341-67 EWT(m)/EWP(v)/EWP(t)/ETI/EWP(k) IJP(c) JD/HM/HM

ACC NR: AR6033106 SOURCE CODE: UR/0137/66/000/007/D043/D043

AUTHOR: Ka'snel'son, M. Ye.; Vol'per, Yu. D.

TITLE: Radio-frequency welding of medium-diameter pipes

SOURCE: Ref. zh. Metallurgiya, Abs. 7D314

REF SOURCE: Tr. Vses. n.-i. in-ta tokov, vysokoy chastoty, vyp. 6, 1965, 123-127

TOPIC TAGS: welding equipment, pipe, radio frequency, radio frequency welding, pipe welding

ABSTRACT: An experimental batch of pipes 89 x 2.5 mm made from steel 20 has been produced by radio-frequency welding at the Dnepropetrovsk Pipe Rolling Plant im. V. I. Lenin in 1960. The quality of the pipes was judged to be considerably higher by technological and hydraulic tests and metallographic examination of the weld than those welded by industrial-frequency current. A new method has been developed for shape forming by which the final shaping of the pipe blank profile is made not in the rollers of the forming mill, but in a special pass arrangement positioned between the forming mill and welding rollers. The new method

Card 1/2 UDC: 621.774.21

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ACC NR: AR6033106

of shape forming makes it possible to produce large-scale radio-frequency welding of batches of pipes 140 x 4.5 mm. The method has been analyzed for successful changeover of pipe electric welding machines 51--152 to the radio-frequency welding. L. Kochenova. [Translation of abstract]

SUB CODE: 13/

Card 2/2 nst

VCL'PERS, G. D.

Naplavka iznosoustoichivymi splavami detalei oborudovaniia promyshlennosti stroitel'nykh materialov /Hard-surfacing of equipment parts in the building materials industry with wear-resistant alloys/. Moskva, Promstroiizdat, 1953. 288 p.

SO: Monthly List of Russian Accessions, Vol. 6 No. 9 December 1953

VOL'PERT, A.

Verbatim: Vol'pert, A. "On the divisibility in the rings of left primary ideal points," Nauch. raboty studentov (L'vovsk. gos. un-t im. Franko), Collection 1, 1948, p. 123-26

SO: U-4355, 14 August 53, (Letopis 'Zhurnal 'nykh Statey, No. 15, 1949.)

Vol'pert, A. I. An elementary proof of Jordan's theorem.
Uspehi Matem. Nauk (N.S.) 5 [illegible] 1950

Source: Mathematical Reviews, Vol 12 No 8

1. VOL'PERT, A. I.

2. USSR (600)

4. Differential Equations Linear

7. Dirchlet problem for an elliptic system of linear differential equations of the second order, on a plane, Ukr. mat. zhur. 3.No. 4, 1951.

9. **Monthly List of Russian Accessions**, Library of Congress, June 1953. Unclassified.

VOL'PERT, A. I.

USSR/Mathematics - Dirichlet's Problem 11 Jul 51

"Dirichlet's Problem For an Elliptic System of Linear Differential Equations of Second Order on a Plane," A. I. Vol'pert, L'vov State U imeni Ivan Franko

"Dok Ak Nauk SSSR" Vol LXXIX, No 2, pp 185-187

Finds the vector u(x,y) regular in region T, continuous in T+L, and satisfying given boundry condition u+(t)=f(t) (t in L). Coeffs A^{ij} of subject eq are square matrices whose elements are differentiable real functions of real variables x,y. Submitted 15 May 51 by Acad M. V. Keldysh.

214T39

VOL'PERT, A.I.

Investigation of boundary problems for ellyptical systems of differential equations on a plane. Dokl. AN SSSR 114 no.3:462-464 My '57. (MIRA 10:8)

1. L'vovskiy lesotekhnicheskiy institut. Predstavleno akademikom I.G. Petrovskim.

(Differential equations, Partial)

ACCESSION NR: AR4039291 S/0044/64/000/003/B072/B072

SOURCE: Ref. zh. Matematika, Abs. 3B349

AUTHOR: Vol'pert, A. I.

TITLE: Normal solvability of boundary value problems for elliptic systems of differential equations on the plane

CITED SOURCE: Sb. Teor. i prikl. matem. Vy*p. 1. L'vov, L'vovsk. un-t, 1958, 28-57

TOPIC TAGS: normal solvability, boundary value problem, differential equation elliptic system, canonical form reduction, non-singular linear transformations, matrix, Cauchy problem, singular Cauchy integral equation

TRANSLATION: For the elliptic system:

$$Lu = A(z)\frac{\partial u}{\partial x} - \frac{\partial u}{\partial y} + B(z)u + \iint_D R(z, \zeta)\, u(\zeta)\, d\xi\, d\eta = f(z), \qquad (1)$$

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ACCESSION NR: AR4039291

where $z=x+iy$, $\zeta = \xi + i\eta$, A, B, R are square matrices of order 2r, the author considers the following problems:

1. The reduction of the elliptic system (1) to canonical form, and particularly, by means of a non-singular linear transformation, the matrix A is reduced to the form

$$A(z) = \begin{pmatrix} A^{(1)}(z) & -A^{(2)}(z) \\ A^{(2)}(z), & A^{(1)}(z) \end{pmatrix},$$

and the r-order matrix $A^{(1)}(z) + iA^{(2)}(z)$ does not have real eigen values.

2. The Cauchy problem for the system conjugate to (1). A necessary and sufficient condition for its solvability is derived.

3. The boundary value problem with boundary condition of the form

$$\Lambda u = a(t)u(t) + \int b(t,t_1)u(t_1)ds_1 = f(t).$$

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ACCESSION NR: AR4039291

The author finds a method of reducing the given boundary value problem to singular Cauchy-type integral equations. V. Venogradov.

DATE ACQ: 22Apr64 SUB CODE: MA ENCL: 00

Card 3/3

VOL'PERT, A.I.

Index of systems of n-dimensional singular integral equations.
Dokl. AN SSSR 152 no.6:1292-1293 O '63. (MIRA 16:11)

1. Institut khimicheskoy fiziki AN SSSR. Predstavleno akademikom I.G. Petrovskim.

VOL'PERT, A.I. (Noginsk)

Elliptic systems on a sphere and two-dimensional singular integral equations. Mat. sbor. 59 (dop.):195-214 '62. (MIRA 16:6)
(Differential equations) (Integral equations)

VOL'PERT, A.I. (L'vov)

Index and normal solvability of boundary value problems for elliptic systems of differential equations on a plane. Trudy Mosk. mat. ob-va 10:41-87 '61. (MIRA 14:9)

(Boundary value problems)
(Differential equations)

34467
S/020/62/142/004/004/022
B112/B102

16.4500

AUTHOR: Vol'pert, A. I.

TITLE: On the index of a system of two-dimensional singular integral equations

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 142, no. 4, 1962, 776 - 777

TEXT: The system of singular integral equations

$$a(x)u(x) + \int_S b(x, y-x)u(y)d_yS + Tu = f(x) \qquad (1)$$

is considered. The difference $\varkappa = k - k^*$ between the dimension numbers k and k^* of the solution spaces of the homogeneous system (1) and its adjoint system is said to be the index of the system (1). The condition of solvability of the system (1) reads $\det \Phi(\tau) \neq 0$ $(\tau \in P)$, where Φ is a certain matrix of the order p and where P is the set of all tangential unit vectors of the surface S which is assumed to be homeomorphic to the sphere. The vector $\psi(\tau) = \varphi(\tau)/|\varphi(\tau)|$, where $\varphi(\tau)$ is one of the columns of $\Phi(\tau)$, maps the set P into the unit sphere. It is demonstrated that the degree $\gamma(\Phi)$ of this mapping is equal to the index of the system (1). S. G.

S/020/62/142/004/004/022
B112/B102

On the index of a ...

Mikhlin (UMN, 3, v. 3, 29 (1948)) and Ya. B. Lopatinskiy (Ukr. matem. zhurn., 5, No. 2, 123 (1953)) are referred to. There are 3 Soviet references.

ASSOCIATION: Institut khimicheskoy fiziki Akademii nauk SSSR (Institute of Chemical Physics of the Academy of Sciences USSR)

PRESENTED: September 20, 1961, by I. G. Petrovskiy, Academician

SUBMITTED: September 15, 1961

Card 2/2

VOL'PERT, A.I.

Index of systems of two-dimensional singular integral equations.
Dokl. AN SSSR 142 no.4:776-777 F '62. (MIRA 15:2)

1. Institut khimicheskoy fiziki AN SSSR. Predstavleno akademikom I.G.Petrovskim.
(Integral equations)

32565
S/550/61/010/000/001/004
D251/D301

16.3500

AUTHOR: Vol'pert, A.I. (L'vov)

TITLE: On the index and normal solubility of the boundary-value problems for an elliptic system of differential equations in a plane

SOURCE: Moskovskoye matematicheskoye obshchestvo. Trudy, v. 10, 1961, 40 - 87

TEXT: The author states that the work will be devoted to two problems. The first is the problem of the index which he defines as the difference between the dimensionality of the subspace of solutions for the corresponding homogeneous problem and the number of independent conditions of solubility of the given case. The second problem is that of the algebraic expression of the Neter boundary-value problems of a general algebraic system of equations with two independent variables. Some auxiliary assumptions on the expansion of operators, defective numbers and the index of linear operators, and the solubility of systems of singular integral equations exact

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to a finite-dimensional subspace are given. A general system of first order equations is considered. D is a finite singly-connected region bounded by a Lyapunov curve Γ. $H_D(H_\Gamma)$ denote real linear spaces of column-vectors of height 2r (r) satisfying the Helder conditions in $\bar{D} = D + \Gamma$ (on Γ), K_1 is a real linear space of column-vectors of height 2r having continuous derivatives in D, continuous in $\bar{D}$ and satisfy the Helder conditions on Γ. [Abstractor's note: Conditions not stated]. Problem I: To find the solution $u \in K_1$ of the elliptic system

$$Lu \equiv a(z)\frac{\partial u}{\partial x} - \frac{\partial u}{\partial y} + a_0(z)u + \iint_D p(z, \zeta)u(\zeta)d\xi\, d\eta = f \qquad (2.1)$$

which satisfies the boundary conditions

$$\Lambda u \equiv b(t)u(t) + \iint_D q(t, \zeta)u(\zeta)d\xi\, d\eta = g \qquad (2.2)$$

$$(t \in \Gamma)$$

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where $f \in H_D$, $g \in H_\Gamma$ are given column vectors, a, a_0, p are real square matrices of order $2r$, b and q are $r \times 2r$ matrices; $z = (x, y)$, $\zeta = (\xi, \eta)$. The corresponding problem $\tilde{I}$ of systems of special form is also considered, in which the matrix $\tilde{a}(z)$ (corresponding to $a(z)$ in problem I) is of the form

$$\tilde{a}(z) = \begin{pmatrix} a_1(z) & -a_2(z) \\ a_2(z) & a_1(z) \end{pmatrix} \qquad (2.8)$$

X

where $a_1(z)$ and $a_2(z)$ are square matrices of order r so that for all proper values of λ the matrix $a_1(z) + ia_2(z)$ lies in the upper λ-half-plane. [Abstractor's note: $a_1(z) + ia_2(r)$ in the text]. By means of the author's earlier work (Ref. 24: Teor. i prikl. matem., no. 1/1958/, 28-57), the index $\varkappa$ of problem I is given by

$$\varkappa = 2I_A(b) + r \qquad (2.31)$$

where b is the matrix of (2.2) and $I_A(b)$ an operator defined in the

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text. [Abstractor's note: Definition is inadequate]. It is observed that a system satisfying the Cauchy-Riemann equations is the simplest example of a system of special form. Higher order systems are then considered. The operator

$$Lu = \sum_{0 \leq k+l \leq n} A_{kl}(z) \frac{\partial^{k+l} u}{\partial x^k \, \partial y^l} \quad (z = (x, y)) \qquad (3.1)$$

is considered, where $A_{kl}(z)$ are real square matrices of order p defined in some region G, $n \geq 1$. The operator is assumed to be elliptic in the sense of I.G. Petrovskiy,

$$\det \sum_{k+l=n} A_{kl}(z)\, \alpha^k \beta^l \neq 0$$

for any $z \in G$ and any real numbers α and β not simultaneously equal to zero. Problems with boundary conditions containing derivatives of order up to $n - 1$ are first considered. The R-conditions are de-

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fined as follows: $D \subset G$ is a finite singly-connected region, bounded by an n-multiply smooth Lyapunov curve Γ, H_D and H_Γ are real linear spaces of column-vectors of height p(r) satisfying the Helder conditions in $\bar{D} = D + \Gamma$ (on Γ); K_n is a real linear space of column-vectors of height p having n continuous derivatives in D and n - 1 continuous derivatives in $\bar{D}$ which satisfy the Helder conditions on Γ. The following problem is considered: Problem II: To find the solution $u \in K_n$ of the system Lu = f, satisfying the boundary condition $\Lambda u = g$, where

$$\Lambda u = \sum_{0 \leqslant k+l \leqslant n-1} B_{kl}(z) \left. \frac{\partial^{k+l} u}{\partial x^k \, \partial y^l} \right|_\Gamma, \quad (3.2)$$

$B_{kl}(z)$ are r x p matrices (r = pn/2), defined on Γ; $f \in H_D$, $g \in H_\Gamma$ are given column vectors. It is assumed that $A_{kl}(z)$ is continuous in the Helder sense in G for $k + l < n$ and has first derivatives

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with respect to x and y continuous in the Helder sense for k · l = n, and that $B_{kl}(z)$ satisfies the Helder conditions on Γ. By considering the characteristic matrices of the operators (3.1) and (3.2), and by the methods of S. L. Sobolev (Ref. 25: Nekotoryye primeneniya funktsional'nogo analiza v matematicheskoy fizike (Some Applications of Functional Analysis in Mathematical Physics) L., 1950), the following basic theorems are established: Theorem 7: For the solubility of problem II exact to a finite-dimensional subspace it is necessary and sufficient that the R-conditions are satisfied. Theorem 8: Let the R-conditions be satisfied for R. Then there exist a finite number of row-vectors $\mu_1, \ldots, \mu_l$, defined and continuous in $\bar{D}$, and of row-vectors $\nu_1, \ldots, \nu_l$ defined and continuous on Γ, such that for the solution of II it is necessary and sufficient that

$$\iint_D \mu_j f dx dy + \int_\Gamma \nu_j g\, ds = 0 \quad (j = 1, \ldots, l) \qquad (3.7)$$

Theorem 9: The index ($\varkappa$) of problem II is given by

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$$\varkappa = 2I(N^{-1}) + rn \qquad (3.42)$$

where

$$I(N^{-1}) = -\frac{1}{2\pi}[\arg\Delta]_{\Gamma}, \qquad (3.37)$$

$$\left.\begin{aligned} (z) &= \det\Big(\sum_{k+l=n-1} B_{kl}(z) i^{k} \omega^{(l)}(z, 0)\Big), \\ \omega^{(l)}(z, 0) &= \frac{d^{l}\omega(z, t)}{dt^{l}}\bigg|_{t=0} \end{aligned}\right\} \qquad (3.38)$$

$$I(N^{-1}) = I_A(B). \qquad (3.40)$$

Problems with more general boundary conditions are then considered. There are 30 references: 29 Soviet-bloc and 1 non-Soviet-bloc.

SUBMITTED: December 10, 1959

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S/021/60/000/009/002/009
D210/D303

16.3500

AUTHOR: Vol'pert, A. I.

TITLE: On reducing boundary value problems of elliptical systems of higher order equations to problems of first order systems

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 9, 1960, 1162 - 1166

TEXT: The author shows how to reduce boundary problems I and II for higher order elliptical equations to corresponding problems of the first order.

$$Lu = \sum_{0 \leqslant k+l < n} A_{kl}(z) \frac{\partial^{k+l} u}{\partial x^k \partial y^l} \quad (z = (x, y)) \qquad (1)$$

is an elliptical differential operator where $A_{kl}(z)$ are real square matrices of order p, determined in some region G; they satisfy con-

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ditions H for $k+l < n$ and have continuous derivatives in Helder's sense, for $k+l = n$. D is a finite simply connected region, bounded by a smooth curve Γ; $\bar{D} = D + \Gamma \subset G$

$$\Lambda u = \sum_{0 \leq +l \leq n-1} a_{kl}(z) \left. \frac{\partial^{k+l} u}{\partial x^k \partial y^l} \right|_{\Gamma} \tag{2}$$

4x

where $a_{kl}(z)$ are matrices of order $np/2 \times p$, determined and continuous in Helder's sense on Γ. Problem I. To find a solution $u \in K_{n,p}$ of the system $Lu = f$ which satisfies a boundary condition $\Lambda u = 0$. Problem II. To find a solution $u \in K_{n,p}$ of the system $Lu = 0$ which satisfies a boundary condition $\Lambda u = g$. $K_{n,p}$ means a linear space of functional columns which have n-th continuous derivatives in D and (n-1)-st continuous derivatives in $\bar{D}$; f and g are given functional columns, satisfying condition H in $\bar{D}$ and on Γ respectively. The author introduces the additional condition

$$[\psi_j, u] = 0 \quad (j = 1, 2, \ldots, m, \; m = \frac{n(n-1)}{2} p). \tag{3}$$

By substitution

$$\frac{\partial^{n-1} u}{\partial x^{n-1} \partial y^{n-k}} = v_k \quad (k = 1, \ldots, n), \; v = \begin{pmatrix} v_1 \\ \vdots \\ v_n \end{pmatrix}, \tag{4}$$

and equality $U(z) = \iint_D Q(z, \zeta) v(\zeta) d\xi \, d\eta \; (\zeta = (\xi, \eta))$ (5)

the problems I and II were reduced to the two following problems: Problem III. To find a solution $v \in K_{1,pn}$ of a system of equations

$$L_1 v \equiv a(z) \frac{\partial v}{\partial x} - \frac{\partial v}{\partial y} + a_0(z) v + \iint_D p(z, \zeta) v(\zeta) d\xi \, d\eta = f_1 \tag{6}$$

which satisfies a boundary condition

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$$\Lambda_1 v \equiv b(z)v + \iint_D q(z, \zeta)v(\zeta)d\xi\, d\eta = 0.$$

Problem IV. To find a solution $v \in K_{1,pn}$ of a system $L_1 v = 0$ which satisfies a boundary condition $\Lambda_1 v = g$. Here

$$a = \begin{pmatrix} A_{1,n-1} & A_{2,n-2} \dots & A_{n-1,1} & A_{n,0} \\ E & 0 & \dots 0 & 0 \\ \dots & \dots & \dots & \vdots \\ 0 & 0 & \dots E & 0 \end{pmatrix}, \quad f_1 = \begin{pmatrix} f \\ 0 \\ \vdots \\ 0 \end{pmatrix},$$

$$b = (a_{0,n-1}, \dots, a_{n-1,0}),$$

On the basis of this reduction, the author proves the normal solvability of higher order boundary problems. The author also proves the formula for index $\varkappa = k - l$ of problems I and II; where k is a number of independent solutions of homogeneous problem I and l = = dim $\mathfrak{M}$,

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$$\varkappa = -2 \text{ ind } A_B + \frac{pn^2}{2} + d. \quad (10)$$

There are 6 Soviet-bloc references.

ASSOCIATION: L'vivs'kyy lisotekhnichenyy instytut (Timber-Engineering Institute, L'viv) X

PRESENTED: by B.V. Gnyedenko, Academician AS UkrSSR

SUBMITTED: June 19, 1959

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28679

S/021/60/000/007/002/009
D211/D305

16.4500

AUTHOR: Vol'pert, A.I.

TITLE: On applying one topological invariant to differential equations

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 7, 1960, 873 - 877

TEXT: In this paper the author considers two conjugate problems for the elliptic system of equations of the first order. The author proves the formula for the index, i.e. the difference between the numbers of linear independent solutions for the given and conjugate problems. His present paper is a continuation of the previous work (Ref. 2: DAS USSR, 114, 462, 1957) and (Ref. 4: DAS UkrSSR 590, 1960) where all notations are given which the author uses in the present paper. Problem 1): To find a solution $u \in K_1$, of the elliptic system of equations

$$a(z)\frac{\partial u}{\partial x} - \frac{\partial u}{\partial y} + a_0(z)u + \iint p(z,\zeta)\,u(\zeta)\,d\xi\,d\eta = f(z), \qquad (3)$$

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which satisfies the boundary condition $B(z)u|_\Gamma = 0$ (4). Here $z = (x, y)$, $\zeta = (\xi, \eta)$, $a(z)$ - a real quadratic matrix of 2r order, with the first derivatives in Helder's sense, continuous in some domain $G \supset \bar{D}$, $B(z)$ - a given real matrix $r \times 2r$, f - a functional column continuous in Helder's sense in $\bar{D}$, D a simply-connected region and Γ - Lyapunov's curve. Let

$$A(z) = \int_\gamma [a(z) - \lambda E]^{-1} d\lambda, \qquad (5)$$

where γ - a contour in a half plane $\operatorname{Im}\lambda > 0$, which contains all the roots of a polynomial. Let $[a(z) - \lambda E]$ which lie in this plane. It is assumed that the additional condition R is fulfilled: The rank of matrix $B(z)\ A(z)$ is equal to r, for all $z \in \Gamma$. Problem 1*) is to find a solution $v \in K_1$ of the system of equations

$$-\frac{\partial a'(z)v}{\partial x} + \frac{\partial v}{\partial y} + a_0'(z)v + \iint_D \rho'(\zeta, z)\, v(\zeta)\, d\xi\, d\eta = g(z).$$

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which satisfies a boundary condition $B_*(z)\ \sigma'(z)v\big|_{\Gamma} = 0$, where $\sigma(z) = a(z) \cos (\nu, x) - \cos (\nu\, y)E$, where ν is normal to Γ at point z. Theorem: If condition R for Problem 1 is satisfied, then condition R for the Problem 1* is fulfilled as well. Three additional theorems could be proved: 1) Subspaces U and V for the solutions of homogeneous Problems 1 and 1* (f = 0, g = 0) have finite dimensions. 2) The necessary and sufficient condition that the problem 1* has a solution, is that the right hand side f is orthogonal to all $v \in V$, i.e.

$$\iint_D v' f dx dy = 0 (v \in V).$$

3) Index ($\varkappa = \dim U - \dim V$) for Problem 1 is calculated by

$$\varkappa = - 2 \text{ ind } A_B + r. \qquad (6)$$

Next, the author gives a generalization for the systems which are not of the canonical type. Let L be an operator determined by the left-hand side of Eq. (3), D_L - a region, where it is determined

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and $$\Lambda u = B(z)u(z) + \iint_D q(z, \zeta)u(\zeta)\, d\xi d\eta \, (z \in \Gamma)$$

where $L_0(\Lambda_0)$ is a part of operator $L(\Lambda)$, determined on the subspace of zeros of operator $\Lambda(L)$ [Abstractor's note: It should probably be $L(\Lambda)$], then the necessary and sufficient conditions that the system of equations $L_0 u = f$; $u \in D_{L_0}$, $f \in R_1$ - has a solution, is that

$$\iint_D \mu_j f dxdy = 0,\ j = 1, \ldots, \beta_{L_0} \left(\int_\Gamma \gamma_j \, g ds = 0,\ j = 1, \ldots, \beta_{\Lambda_0} \right).$$

There are 8 Soviet-bloc references.

ASSOCIATION: L'vivs'kyy lisotekhnichnyy instytut (Lviv Timber-Engineering Institute)

PRESENTED: by Academician B.V. Gnyedenko, AS UkrSSR

SUBMITTED: June 19, 1959

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VOL'PERT, A. I.

Doc Phys-Math Sci - (diss) "Study on the theory of boundary problems for elliptical systems of equations having two independent variables." Moscow, 1961. 6 pp; (Ministry of Higher and Secondary Specialist Education RSFSR, Moscow Order of Lenin and Order of Labor Red Banner State Univ imeni M. V. Lomonosov); 200 copies; price not given; bibliography on p 6 (17 entries); (KL, 6-61 sup, 191)

VOL'PERT, A.I.

On the application of a topological invariant to differential equations. Dop.AN URSR no.7:873-877 '60. (MIRA 13:8)

1. L'vovskiy lesotekhnicheskiy institut. Predstavleno akademikom AN USSR B.V.Gnedenko [B.V.Hniedenko].
(Differential invariants)

VOL'PERT, A.I.

Reduction of boundary value problems for elliptical systems of equations of a higher order to problems for systems of the first order. Dop.AN URSR no.9:1162-1166 '60. (MIRA 13:10)

1. L'vovskiy lesotekhnicheskiy institut. Predstavleno akademikom AN USSR B.V.Gnedenko.
(Boundary value problems)

VOL'PERT, A.I.

Some theorems on linear operators. Dop.AN URSR no.5:590-594 '60. (MIRA 13:7)

1. L'vovskiy lesotekhnicheskiy institut. Predstavleno akademikom AN USSR B.V.Gnedenko [B.V.Hniednko].
(Operators (Mathematics))

VOL'PERT, A.I.

Index of boundary value problems for a system of harmonic functions with three independent variables. Dokl.AN SSSR 133 no.1:13-15 Jl '60. (MIRA 13:7)

1. L'vovskiy lesotekhnicheskiy institut. Predstavleno akademikom I.G.Petrovskim.
(Functional analysis)

16(1)

AUTHOR: ~~Vol'pert, A.I.~~ SOV/20-127-3-1/71

TITLE: On the First Boundary Value Problem for Elliptic Systems of Differential Equations

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 3, pp 487-489 (USSR)

ABSTRACT: In the finite, simply connected domain D with the n-fold smooth boundary Γ the author considers the boundary value problem

$$\left.\frac{\partial^k u}{\partial y^k}\right|_\Gamma = 0 \quad (k = 0,1,\dots,m)$$

for the elliptic system

$$\sum_{0 \leqslant k+l \leqslant n} A_{kl}(z) \frac{\partial^{k+l} u}{\partial x^k \partial y^l} = f(z) \qquad (z = (x,y))$$

$A_{kl}(z)$ are quadratic matrices of order p; in $D + \Gamma$ they have continuous derivatives in the sense of Hölder of order $k + l$; f is the given column and u the sought column; $\partial/\partial y$ denotes the derivative with respect to the normal to Γ; n is the

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number of pairs; $m = \frac{1}{2} n - 1$. The solution is sought in the class of functions with n continuous derivatives in D and (n - 1) continuous derivatives in D + Γ. It is supposed that for all $z \in \Gamma$ it holds :

$$\det \int_{-\infty}^{\infty} Q'(\lambda) X^{-1}(z,\lambda) Q(\lambda) d\lambda \neq 0,$$

where $X(z,\lambda) = \sum_{k+l=n} A_{kl}(z)\lambda^{l}$; $Q(\lambda) = (E, E\lambda, \ldots, E\lambda^{n})$,

E unit matrix of order p; Q' transposed to Q. For the problem formulated above the author gives an explicit formula for the determination of the index. The formula is obtained with the aid of a triangulation of D and generalizes the formula obtained by the author in [Ref 4] for the index of the Dirichlet problem for n = 2 to the multidimensional case.

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On the First Boundary Value Problem for Elliptic Systems of Differential Equations SOV/20-127-3-1/71

Ya.B. Lopatinskiy is mentioned in the paper. There are 4 Soviet references.

ASSOCIATION: L'vovskiy lesotekhnicheskiy institut (L'vov Forest Technical Institute)

PRESENTED: April 8, 1959, by I.N. Vekua, Academician

SUBMITTED: March 24, 1959

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16(1) SOV/20-127-4-2/60

AUTHOR: Vol'pert, A.I.

TITLE: Boundary Value Problems for Elliptic Systems of Differential Equations of Higher Order on a Plane

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 4, pp 739-741 (USSR)

ABSTRACT: In the finite domain D bounded by Γ the problem

$$(1) \quad \sum_{0 \leq k+l \leq n} A_{kl} \frac{\partial^{k+l} u}{\partial x^k \partial y^l} = f \quad ,$$

$$(2) \quad \Lambda_j u \quad \sum_{0 \leq k+l \leq m_j} a_{kl}^{(j)} \frac{\partial^{k+l} u}{\partial x^k \partial y^l} \Bigg|_{\Gamma} = 0 \quad (j=1,\ldots,\frac{pn}{2})$$

is considered. Under numerous conditions (among them those of Ya.B.Lopatinskiy [Ref 5] it is shown that the homogeneous problem ($f \equiv 0$) has finitely many (k) linearly independent solutions. For the solvability of the inhomogeneous problem it is necessary and sufficient that $\iint\limits_D v_j' f \, dx \, dy = 0$, where v_j is a

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Boundary Value Problems for Elliptic Systems of Differential Equations of Higher Order on a Plane

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certain function. It is proved that there exist finitely many linearly independent columns with this property. For the index of the problem $\varkappa = k-1$ an explicit expression is given which bases on the results of [Ref 6]. The author investigates the dependence of the index $\varkappa$ on the index $\varkappa_0$ of the first boundary value problem for (1). He mentions I.N.Vekua. There are 6 Soviet references.

ASSOCIATION: L'vovskiy lesotekhnicheskiy institut (L'vov Technological Institute of Forestry)

PRESENTED: April 8, 1959, by I.N.Vekua, Academician

SUBMITTED: March 24, 1959

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20-114-3-3/60

AUTHOR: Vol'pert, A. I.

TITLE: The Investigations of the Boundary Problems for Elliptical Systems of Differential Equations in a Plane (Issledovaniye granichnykh zadach dlya ellipticheskikh sistem differentsial-nykh uravneniy na ploskosti)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol. 114, Nr 3, pp. 462-464 (USSR)

ABSTRACT: The present paper investigates boundary problems for elliptical systems of equations of the first order. Also the boundary problem given in the following is reduced in an equivalent manner (in the sense given below). - Problem Nr 1 - The Solution U(z) of the class K_n of the elliptical system

$$\sum_{k+\ell \leqslant n} A_{k\ell}(z) \frac{\partial^{k+\ell} U}{\partial x^k \partial y^\ell} = F(z) \qquad (z = x+iy \in D),$$

is sought, which satisfies the boundary condition

$$\sum_{k+\ell \leqslant n-1} \left[a_{k\ell}(t)\, U^+_{k\ell}(t) + \int b_{k\ell}(t, t_1)\, U^+_{k\ell}(t_1) ds_1 \right] = f(t)$$

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($t \in \Gamma$). Here $A_{k\ell}(z)$ denotes the real, quadratic matrices of the order p in a certain domain $\tilde{D}$. By making use of a certain substitution given here problem Nr 1 is reduced to the following problem Nr 2. -
A column having a height $2r = np$ is to be found as well as a constant column c with the height $r(n-1)$, which satisfies the system of equations. -

$$Lu = A(z)\frac{\partial u}{\partial x} - \frac{\partial u}{\partial y} + B(z)u + \iint_D R(z,\zeta)u(\zeta)d\xi\, d\eta = F(z)+M(z)c$$

and the boundary condition

$$\Lambda u = a(t)u(t) + \int_\Gamma b(t,t_1)u(t_1)ds_1 = f(t)+N(t)c \quad (\text{with } (t\in\Gamma)).$$

Here is true that $z = x + iy \in D$, $\zeta = \xi + i\eta$.
The author investigates the problem Nr 2 by the method developed by I. N. Vekua. Problem Nr 2 is here deduced to the form $\mathcal{L}u = 0$, $\Lambda u = f$. Every solution $u(z)$ of the system $\mathcal{L}u=0$ can be represented in the form

$$u(z) = \int_\Gamma M(\zeta, z)\,\mu(\zeta)d_\zeta s + \sum_{j=1}^{r} c_j u^{(j)}(z).$$ Here $\mu(\zeta)$ denotes

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a column with the height r, which satisfies Gelder's condition T and c_j ($j = 1, \ldots r$) are constants. By means of the representation mentioned the problem $\mathcal{L}u = 0$, $\Lambda u = f_0$ is reduced to an equivalent system of singular integral equations with a kernel of the Cauchy type. For the solvability of the problem $Lu = F$, $\Lambda u = 0$ it is necessary and sufficient that F be orthogonal with respect to all solutions of the adjoined homogeneous problem. There are 9 references, 9 of which are Slavic.

ASSOCIATION: Institute for Wood Technology, L'vov (Lemberg) (L'vovskiy lesotekhnicheskiy institut)

PRESENTED: December 11, 1956, by I. G. Petrovskiy, Member of the Academy

SUBMITTED: May 10, 1956

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VOL'FERT, A.I.

Calculations of the index of the Dirichlet problem. Dop.AN URSR. no.10:1042-1044 '58. (MIRA 12:1)

1. L'vovskiy lesotekhnicheskiy institut. Predstavil akademik AN USSR B.V.Gnedenko [B.V.Hniedenko].
(Differential equations)

AUTHOR: Vol'pert, A.I. SOV/21-58-10-3/27

TITLE: On the Calculation of the Index of Dirichlet's Problem (O vychislenii indeksa zadachi Dirikhle)

PERIODICAL: Dopovidi Akademii nauk Ukrains'koi RSR, 1958, Nr 10, pp 1042 - 1044 (USSR)

ABSTRACT: The author considers a homogeneous Dirichlet problem for an elliptic system of differential equations

$$\sum_{0 \leq k+l \leq 2} A_{kl}(z) \frac{\partial^{k+l} u}{\partial x^k \partial y^l} = 0$$

where z denotes a point (x,y); $A_{kl}(z)$ are real square matrices of p-order given in some region D, which have derivatives with respect to x and y up to the order k + 1, continuous in a sense given by Gel'der; u is a functional column composed of p elements. The ellipticity is understood in the sense attached to this word by I.G. Petrovskiy [Ref.1,2]. It is assumed that Ya.B. Lopatinskiy's condition [Ref.3] has been fulfilled, which guarantees the finiteness of numbers k and k' of the linear independent solutions of the problem in question and of that adjoint to it, that is given by the following system of equations:

$$\sum_{0 \leq k+l \leq 2} (-1)^{k+l} \frac{\partial^{k+l} A'_{kl} v}{\partial x^k \partial y^l} = 0$$

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On the Calculation of the Index of Dirichlet's Problem

The author derives formulae for the calculation of the index ($\varkappa = k - k^*$) of Dirichlet's problem through the minors of a certain matrix $R(z)$. An example of the system of differential equations is given, in which $\varkappa$ may be any even number with the proper selection of the function φ. There are 4 Soviet references.

ASSOCIATION: L'vovskiy lesotekhnicheskiy institut (L'vov Lumber Engineering Institute)

PRESENTED : By Member of the AS UkrSSR, B.V. Gnedenko

SUBMITTED: April 24, 1958

NOTE: Russian title and Russian names of individuals and institutions appearing in this article have been used in the transliteration.

1. Dirichlet functions 2. Differential equations 3. Mathematics --Indexes

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Vol'Pert, A. I.

Transactions of the Third All-union Mathematical Congress (Cont.) Moscow, Jun-Jul '56, Trudy '56, V. 1, Sect. Rpts., Izdatel'stvo AN SSSR, Moscow, 1956, 237 pp. Field method in the theory of hyperbolic systems of differential equations of mathematical physics.

Barbashin, Ye. A. (Sverdlovsk). Work of Sverdlovsk Seminar Members on the Qualitative Methods of the Theory of Differential Equations. 42-43

Mention is made of Skalkina, M. A., Repin, Yu. M., Yegorov, V. G., Lushnikova, Z. M., and Tabuyeva, V. A.

Bykov, Ya. V. (Moscow). On the Asymptotic Behavior of Solutions of Integral Differential Equations of Volterra Type. 43

Vol'pert, A. I. (Moscow). Investigation of a Boundary Problem for Elliptic Systems of Differential Equation in a Plane. 43-44

There is 1 USSR reference.

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AUTHOR: Vol'pert, A.I.

TITLE: On the Index of the Dirichlet Problem

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Matematika, 1960, No. 5, pp. 40 - 42

TEXT: By an explicitly solvable example it is shown that the index of the Dirichlet problem for an elliptic system may be equal to an arbitrary even number.
The author considers

$$(1)\quad \frac{\partial}{\partial x}\left(a\frac{\partial u}{\partial x}\right) + \frac{\partial}{\partial x}\left(b\frac{\partial u}{\partial y}\right) + \frac{\partial}{\partial y}\left(c\frac{\partial u}{\partial x}\right) + \frac{\partial}{\partial y}\left(a'\frac{\partial u}{\partial y}\right) = 0$$

where

$$a = \frac{1}{\Delta}\begin{pmatrix} q & p-1 \\ p+1 & -q \end{pmatrix}; \quad b = \frac{1}{\Delta}\begin{pmatrix} -p+1 & q \\ q & p+1 \end{pmatrix}$$

$$c = \frac{1}{\Delta}\begin{pmatrix} p+1 & -q \\ -q & -p+1 \end{pmatrix}; \quad a' = \frac{1}{\Delta}\begin{pmatrix} q & p+1 \\ p-1 & -q \end{pmatrix}$$

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On the Index of the Dirichlet Problem

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$\Delta = 1 - p^2 - q^2$; p, q are polynomials : $p = \lambda \operatorname{Re} z^n$, $q = \lambda \operatorname{Im} z^n$
($z = x + iy$, $0 < \lambda < 1$) ; $u = \begin{pmatrix} u_1 \\ u_2 \end{pmatrix}$; n is an arbitrary natural number.
(1) is elliptic in $|z| \leq 1$ since

$$\det(a\alpha^2 + b\alpha\beta + c\alpha\beta + a'\beta^2) = \frac{1}{\Delta}(\alpha^2 + \beta^2)^2 .$$

Let K be the class of functions continuous in $|z| \leq 1$ together with their first derivatives, and having continuous second derivatives in $|z| < 1$. Problem : Determine in D a solution of the class K of (1) which satisfies the boundary condition $u|_\Gamma = 0$, where Γ is the circle $|z| = 1$.
It is shown that this problem has the index 2n .
There is 1 Soviet reference.

ASSOCIATION: L'vovskiy lesotekhnicheskiy institut (L'vov Forest-Technical Institute)

SUBMITTED: October 30, 1958

Card 2/2

S/021/60/000/005/003/015
D210/D304

AUTHOR: Vol'pert, A.I.

TITLE: Some theorems on linear operators

PERIODICAL: Akademiya nauk ukrayins'koyi RSR Dopovidi, no. 5, 1960, 590-594

TEXT: The author states and proves certain lemmas on linear operators in linear spaces, and hence proves the normal solubility of one special class of linear operators with boundary value problems for elliptic systems of differential equations. The following notation is used. R and R_1 are linear space, A is an operator which transforms elements of R into elements of R_1, $\mathfrak{D}_A$ is the region of definition of A, $\mathfrak{R}_A$ is the region of values of A, $\mathfrak{Z}_A$ is the subspace of zeros, i.e. the set of solutions u of the equation $Au = 0$ $(u \in \mathfrak{D}_A)$, $\alpha_A = \dim \mathfrak{Z}_A$, $\beta_A = \dim (R_1/R_A)$. [Abstractor's Note: R_A is not defined]. If α_A and α_A

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are finite then A is finite, and $\varkappa_A$, defined by $\varkappa_A = \alpha_A - \beta_A$, is called the index of A. Further, if A and B are operators which transform elements of R into elements of R_1 and R_2 respectively, then A_o (B_o) denotes the part of A (B) which is defined on $\mathfrak{Z}_B$ ($\mathfrak{Z}_A$). Lemma 1: β_A and B_o are finite if and only if β_B and A_o are finite. In this case $\varkappa_{A_o} + \beta_A = \varkappa_{B_o} + \beta_B$ (1) Lemma 2: Ψ is a linear space of linear functions over R_2, and Φ is a linear space of linear functions defined over R_1. Ψ_o is the subspace of functions $\psi \in \Psi$ orthogonal to R_B. It is assumed that for each $\psi \in \Psi_o$ there is a corresponding $\varphi \in \Phi$ such that $\varphi(Au) = \psi(Bu)$ (3), for all $u \in R$. Then from the normal solution of the operators B_o and A follows the normal solution of A_o. Lemma 3: Let R_1, R_2, R_3 be linear spaces, and A and B linear operators which

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transform from R_2 into R_3 and from R_1 into R_2 respectively. $\mathfrak{D}_A = R_2$. Further $C = AB$ has a finite d-characteristic, and one of the numbers α_A or β_B is finite. Then A and B have finite d-characteristics and $\varkappa_C = \varkappa_A + \varkappa_B$ (6). In the case when R_1, R_2 and R_3 are Banach spaces, Eq. (6) was investigated by F.V. Atkinson (Ref. 2: Matem.sb., 28, 3 (1951)) for bounded operators and by I. Ts. Hokhberh (Ref. 3: Matem.sb., 33, 193(1953)). D is a finite singly-connected region, bounded by Lyapunov's Γ -curve. The elliptic integro-differential operator

$$Lu = a_1(z)\frac{\partial u}{\partial x} - \frac{\partial u}{\partial y} + a_0(z)u + \iint_D p(z,\zeta)\,u(\zeta)\,d\xi\,d\eta$$

is considered, where a_1, a_0, p are real square matrices of order 2r, u is a column vector with 2 r elements; $z = x+iy$, $\zeta = \xi + i\eta$. It is assumed that the matrix $a_1(z)$ has first derivatives with respect to x and y which are continuous in Helder's sense in some space $G \supset D + \Gamma$; $a_0(z)$ satisfies Helder's condition in G;

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$p(z, \zeta) = \dfrac{\tilde{p}(z, \zeta)}{|z - \zeta|^{\rho}}$ $(0 \leq \rho < 2)$ where $p(z, \zeta)$ satisfies Helder's conditions with respect to z and ζ in G. $a_1(z)$ has canonical form

$$a_1(z) = \begin{pmatrix} a^{(1)}(z) & - & a^{(2)}(z) \\ a^{(2)}(z) & & a^{(1)}(z) \end{pmatrix} \quad (9)$$

and all the eigen-values $\lambda(z)$ of the matrix $a^{(1)}(z) + i\, a^{(2)}(z)$ lie in the upper λ- half-plane. K_1 is a linear space of column-vectors defined and continuous in $D + \Gamma$, which have first-order continuous derivatives in D and satisfy Helder's condition on Γ. R_1 (R_2) is the linear space of column-vectors which satisfy Helder's condition in $D + \Gamma$, (on Γ). A is the operator whose region of definition is the set R of all $u \in K_1$, such that for $Lu \in R_1$, $Au = Lu$ $(u \in R)$. Theorem 1: The imperfect numbers of the operators A and B and the d-characteristics of A_o and B_o are finite. The following formulae hold:

Some theorem...

$$\varkappa_{A_0} = \frac{1}{\pi}[\arg\det(b_1 + ib_2)]_\Gamma + r + \beta_B, \quad (12)$$

$$\varkappa_{B_0} = \frac{1}{\pi}[\arg\det(b_1 + ib_2)]_\Gamma + r + \beta_A, \quad (13)$$

where $[\ ]_\Gamma$ denotes the increase in the term inside the brackets produced when z goes round Γ once in the direction which keeps D on the left. Proof. $B^{(1)}$ denotes the operator whose region of definition is R, which satisfies (10) for q=0. A_1 (B_1) is the part of A ($B^{(1)}$) defined on $\mathfrak{Z}_{B^{(1)}}$ ($\mathfrak{Z}_A$). It follows that A_1 has finite d-characteristic and that

$$\varkappa_{A_1} = \frac{1}{\pi}[\arg\det(b_1+ib_2)]_\Gamma + r. \quad (14)$$

Also $\beta_B(1) = 0$. Hence from Lemma 1: β_A and the d-characteristic of B_1 are finite and $\varkappa_{B_1} = \varkappa_{A_1} + \beta_A$. (15) T is the integral operator from Eq. (5) in Vol'pert, A.I. (Ref.4: DAN SSSR, 114, 462 /1957/), transforming from R_2 into $\mathfrak{Z}_A$. Writing $S=B_0T$, $S_1 = B_1T$, where S

and S_1 are singular integral operators of normal type. From Lemma 3, B_o has finite d-characteristic and $\varkappa_S - \varkappa_{S_1} = \varkappa_{B_o} - \varkappa_{B_1}$, taking into consideration that is S and S_1 have only regular components $\varkappa_S = \varkappa_{S_1}$, $\varkappa_{B_o} = \varkappa_{B_1}$ applying Lemma 1, and simplifying gives the desired results. Theorem 2: There exists a system of linearly independent row vectors ν_j, continuous on Γ, such that for the solution of the equations $B_o u = g$ ($u \in \mathfrak{D}_{B_o}$, $g \in R_2$) it is necessary and sufficient that $\int_D\int \mu_j f dxdy = 0 (j=1,\dots,\beta_{A_o})$. Proof: the first part of the theorem follows from $S = B_o T$ and the known properties of singular integral operators. The second part makes use of lemma 2, making Φ of the form $\varphi(f) = \int_D\int \tilde{\xi} f dx\, dy$, where the $\tilde{\phi}$ are row-vectors continuous in $D + \Gamma$, and the ψ are of the form $\psi(g) = \int_\Gamma \tilde{\psi}\, g ds$, where the $\tilde{\psi}$

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are row-vectors continuous on Γ. Further, there exists a matrix $\omega(z, \zeta)$ such that for $f \in \mathfrak{P}_A$, the column-vector

$$u(z) = \int_D\int \omega(z, \zeta) f(\zeta)\, d\xi\, d\eta \qquad (16)$$

is dependent on R and satisfies Au = f. Then for arbitrary ν_j ($j = 1, \ldots, \beta B_o$) there exists a row-vector h_j continuous in $D + \Gamma$, such that

$$\int_\Gamma \nu_j Bu\, ds = \int_D\int h_j Au\, dx\, dy. \qquad (17)$$

This holds for all u R, and the normal solution of A_o follows from lemma 2. There are 4 Soviet-bloc references.

ASSOCIATION: L'vivs'kyy lisotekhnichnyy instytut (L'viv Institute of Forestry)

PRESENTED: by Academician AS UkrSSR B.V. Hnyedenko

SUBMITTED: June 19, 1959

VOL'PERT, A. P.

USSR/Radio
Radiation - Resistance
Vibrators

Nov/Dec 48

"Concerning the Resistance of Radiation of a Vibrator Surrounded by a Spherical Magneto-Dielectric Envelope," A. P. Vol'pert, Cand Eng Sci, 19 3/4 pp

"Radiotekh" Vol III, No 6

Investigates influence of parameters of a magneto-dielectric spherical envelope on the radiation resistance of a vibrator. Shows that under certain conditions radiation resistance may be considerably increased. Gives physical interpretation of phenomena which determine the influence of a magneto-dielectric envelope, which can be extended to other forms of

FDB 30/49T102

USSR/Radio (Contd) Nov/Dec 48

magneto-dielectric envelopes. Submitted 5 Jul 48.

FDB 30/49T102

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C 111/ C 333

AUTHOR: Vol'pert, A. J.

TITLE: Indices of Boundary Value Problems for a System of Harmonic Functions With Three Independent Variables

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 1, pp. 13-15

TEXT: The following problem is considered: In the domain D determine a continuous and two times continuously differentiable solution u of the system $\Delta u = 0$ which satisfies the condition

(I) $$\lim_{x \to y} B(y, \frac{\partial}{\partial x}) u(x) = f(y) \qquad (x \in D,\ y \in S).$$

Here D is a finite convex domain in the space $x = (x^1, x^2, x^3)$ with the three times smooth boundary S; Δ is the Laplace operator;

(1) $$B(y, \frac{\partial}{\partial x}) u(x) = b \frac{\partial u}{\partial \nu} + B_1 (y, \frac{\partial}{\partial x}) u + B_0(y) u,$$
$$B_1(y, \frac{\partial}{\partial x}) = B^k(y) \frac{\partial}{\partial x^k},$$

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Indices of Boundary Value Problems for a System of Harmonic Functions With Three Independent Variables

b complex number, $\frac{\partial}{\partial \nu}$ derivative with respect to the normal of S in the point y; $B^k(y)$ (k = 0, 1, 2, 3) complex quadratic $p \times p$ matrices; f(y) and u columns with p elements.

The author investigates the index problem posed by J. M. Gel'fand (Ref.1). It is shown that the index of (I) in general is different from zero and can attain arbitrary even values. An explicit formula for the calculation of the index is given. The problem of the homotopic classification (Ref. 2) of elliptic systems of equations closely connected with the index problem is simultaneously treated. The homotopic classification of the systems of first order on the sphere is particularly connected with problem I. The author gives necessary and sufficient conditions that two elliptic systems of this kind belong to the same homotopic class. There are four theorems.

The author mentions Z. Ya. Shapiro and Ya. B. Lopatinskiy.

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Indices of Boundary Value Problems for a System of Harmonic Functions With Three Independent Variables

There are 6 Soviet references.

ASSOCIATION: L'vovskiy lesotekhnicheskiy institut (L'vov-Forest-Technical Institute)

PRESENTED: March 5, 1960, by J. G. Petrovskiy, Academician

SUBMITTED: March 3, 1960

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VOL'PERT, A. R.

PA 19T28

USSR/Antennas - Design
Antennas, Directive

Sep 1946

"Calculation of the Influence of the Boundary Plane on the Directional Pattern of Arbitrary Antennae," A. R. Vol'pert, Candidate of Mech Sci, 15 pp

"Radiotekhnika" Vol I, No 6

Reflection phenomena are employed to establish a general method of calculating the influence of the surface of the boundary plane on the directional pattern of arbitrary antennae. The concepts of the "electrical center" and the "electrical height" of the antenna above the boundary plane are introduced.

19T28